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SPECIFICATION

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[Cushions with Non-Intersecting-Columnar Elastomeric Members Exhibiting Compression Instability]

Cross Reference to Related Applications

This patent application is a continuation-in-part patent application of serial no. 09/303,979 filed on May 3, 1999, now U.S. Patent No. _____, which is a continuation-in-part patent application of serial no. 08/968,750 filed on August 13, 1997, now U.S. Patent No. 6,026,527, which is a continuation-in-part patent application of serial no. 08/601,374 filed on February 14, 1996, now U.S. Patent No. 5,749,111 and which is a continuation in part of serial no. 08/783,413 filed on January 10, 1997, now U.S. Patent No. 5,994,450, which claims priority to U.S. provisional patent application serial no. 60/021,019 filed on July 1, 1996, and priority is claimed to each of the foregoing. Priority is also claimed to U.S. provisional patent application no. 60/226,726 filed on August 18, 2000.

Background of Invention

- [0001] The invention relates to the field of cushioning, and in particular cushions made from soft elastomeric material, including gelatinous elastomers, and those cushions that operate according to a principle of compression instability.
- [0002] Previously, the inventor made inventions concerning gelatinous elastomers ("gels") disclosed and claimed in U.S. Patent No. 5,994,450, which is hereby incorporated by reference. The inventor has also made inventions in the field of elastomeric cushions with intersecting or joined buckling columns, as disclosed and claimed in U.S. Patent Nos. 5,749,111 and 6,026,527, which are hereby incorporated by reference. These are referred to herein as cushions having intersecting-columnar members.
- [0003] In cushions having intersecting-columnar members, column walls are shared between columns. When an irregularly-shaped object is placed on the buckling column cushion, the walls will buckle under areas of peak load, thereby relieving and

distributing cushioning pressure. The buckling occurs when maximum support pressure per the cushion design is exceeded in a particular area of the cushion. Buckling is accomplished by the column walls buckling or folding on themselves. Surrounding columns support the cushioned object even though buckling has occurred in an area of peak load. In this way, pressure is reasonably equalized without significant high pressure points.

[0004] Although intersecting-wall buckling columns are very efficient and useful and represent a significant advance in the science of cushioning, they are not totally without problems and challenges. One problem with cushions having intersecting-columnar members is manufacturability. When buckling column cushions having intersecting-columnar members are molded, the gel material from which they are made must flow into a mold and meet itself at each column intersection. There are a myriad of such intersections, one at every corner of every joined column. At these intersections, there is a knit line. Knit lines are at risk of having poor strength due to incomplete melding of opposing flows of flowing gel material.

[0005] A second problem with cushions having intersecting-columnar members is weight. Joinder of adjacent columns in buckling cushions having intersecting-columnar members adds to the stability of each individual column because they each can derive stability from adjoining columns. Thus, in order to achieve buckling at a low load level, buckling cushions having intersecting-columnar members must be relatively tall, high or deep. Increasing the size of the cushion in this dimension adds gel material and increases weight (and material expense).

[0006] A third problem with cushions having intersecting-columnar members relates to the manufacturing constraints concerning size. In making molds for an injection molding process, there are constraints on the minimum saw kerfs and minimum thicknesses of passageways within the mold to achieve acceptable gel flow.

[0007] A fourth problem with cushions having intersecting-columnar members is tooling cost. Molds and dies for making buckling cushions having intersecting-columnar members are complex and time consuming and costly to make.

[0008] The prior art included patterned gel cushions. Patterned gel cushions are gels with patterns, cuts or texture having geometric shapes and dimensions insufficient to produce elastomeric members that have compression instability. The pattern merely accommodates changing shape of the gel as it compresses. Thus, although those prior art devices at first glance may have some physical resemblance to the invention, they fail to include either the structure or functionality that is the subject of the present invention.

Summary of Invention

